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27 June 1961

OPTICAL SYSTEM DISTORTION - SUMMARY:

PROBLEM:

The radial distortion of the system, although very small (0.68%), produces a linear image motion in the direction of film transport, which is roughly proportional to the square of the field angle and amounts to 35μ at 10° for the widest slit (0.20 inches). This motion, if not corrected, would seriously degrade the performance, which is still believed to be achievable as previously predicted.

TECHNICAL SOLUTIONS TO PROBLEM:

(1) Modify optical design; (2) restrict slit width; and (3) reduce field angle of high resolution coverage.

PROPOSED ACTION FOR PRODUCTION UNITS:

Senior Optical Designer is to attempt to provide a modified design by 1 Sep 61 which, as a design objective, causes only 1μ image mption at 10° and, which, as a minimum objective, produces 1μ at 5° and 4μ at 10°. An attempt is to be made to have design changes kept small, but this is to be subsidiary to satisfying resolution and distortion requirements.

PROPOSED ACTION FOR PROTOTYPE UNIT:

This distortion provides a very elegant and simple means to perfect scanner-transport synchronization since it provides a precisely known range of image velocities. Although the distortion was unintentional, it is a valuable test instrument, and, since no other fully satisfactory test is available, we propose to retain it as such, at least until the best solution to the production unit problem is known.

ALTERNATIVE(S) TO PROPOSAL:

(1) Use a faster film (say SO-221), thus reducing slit width. Consequence is that predicted performance could not be achieved due to film limitation and residual image motion due to distortion.

(2) Accept degradation from predicted performance at field angles above about $2\text{-}1/2^{\circ}$ (for nominal exposure times with SO-132).

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This is not recommended, since image motion is still 5μ at 5°, and hence totally limiting.

(Concurred in: RMS, MDR, RVS, ASM, AO 23 Jun 61)

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FIG. 1

IMAGE MOTION VS. FIELD ANGLE FOR VARIOUS SLIT WIDTHS

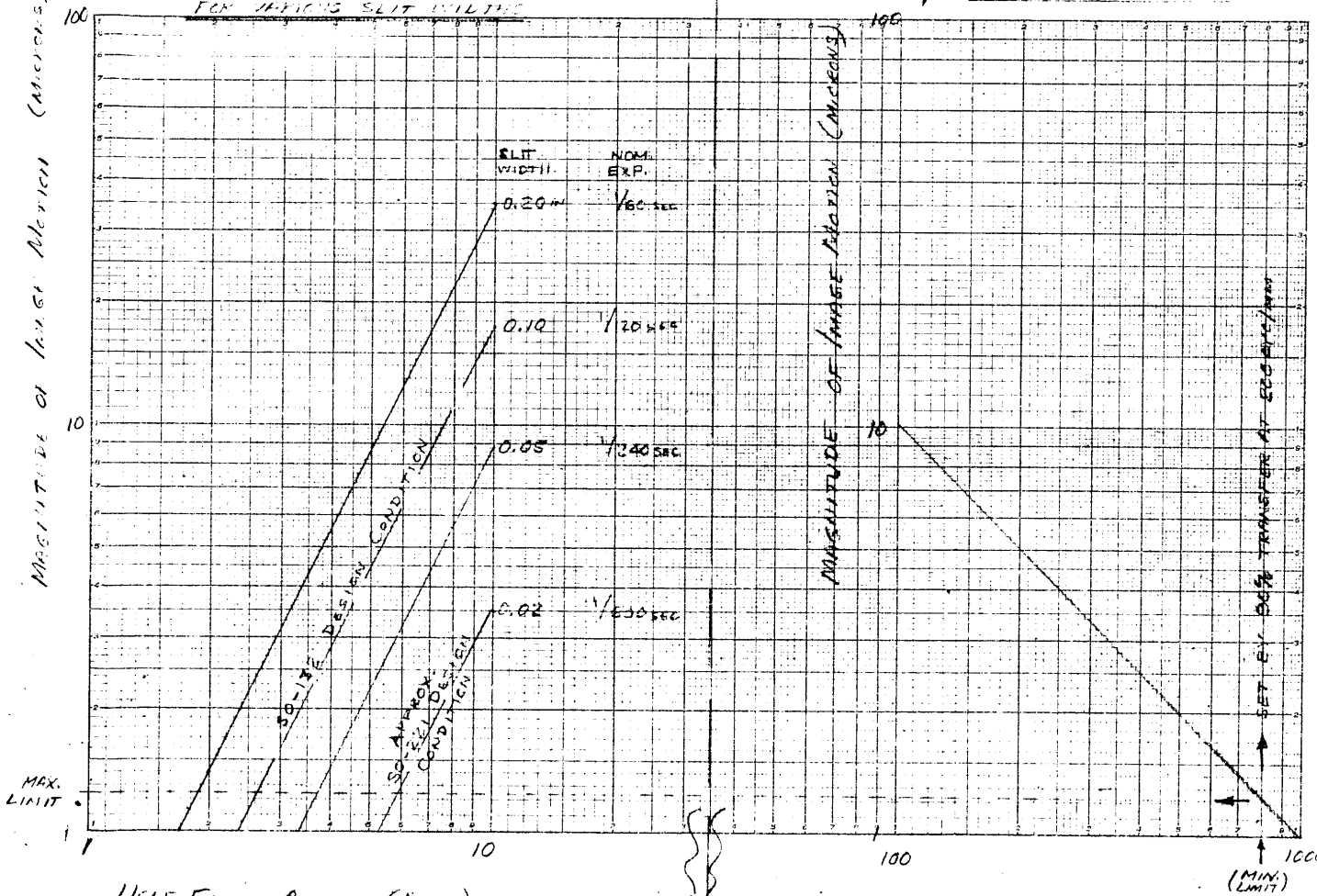

FIG. 2

IMAGE MOTION VS. LIMITING FREQUENCY